ER70

ELECTRICAL WORKERS REGISTRATION BOARD

SAFETY | COMPETENCY | COMPLIANCE

Candidate Code No.	
For Board Use Only	
Result	Result
Date	Date
Int	Int

ELECTRICIANS REGULATIONS EXAMINATION

21 November 2015

QUESTION AND ANSWER BOOKLET

Time Allowed: Three hours

INSTRUCTIONS – READ CAREFULLY

You have 10 minutes to read this paper but do not start writing until you are told to do so by the supervisor.

Write your Candidate Code Number in the box provided above. Your name must NOT appear anywhere in this paper.

Answer all questions.

The pass mark for this examination is 60 marks.

Use a pen for written answers. **Do not** use pencils or red pens.

Drawing instruments and pencils may be used when diagrams are required. Marks are allocated on the basis of correctness.

Do not use correcting fluid or correcting tape.

It is recommended that the reference source for your answers be included in the space provided if a question can be answered from the Act, Regulations, Standard or Code of Practice. However, just stating a reference only will earn no marks.

For calculation questions all workings, including formulae, must be shown to gain full marks.

You will need to use the following documents in this examination:

- Electricity (Safety) Regulations 2010 reprint dated 1 February 2014 or the reprint dated 1 August 2014
- AS/NZS 3000:2007 (incorporating amendments 1 and 2)
- NZECP 34

PLEASE HAND THIS PAPER TO THE SUPERVISOR BEFORE LEAVING THE ROOM

(turn over)

Question 1

(a) Fittings **are installed** in an electrical installation.

Refer to the Electricity (Safety) Regulations 2010 and state **TWO** situations where **fittings that are installed** in an installation are **specifically** deemed to be electrically unsafe.

(2 marks)

(1) ____

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(2) ____

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Ref: ....

(b) Refer to the Electricity (Safety) Regulations 2010 and state the circumstance where an electrical appliance may **cause injury** to a person and is **not electrically unsafe**.

(2 marks)

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Ref: ....

(turn over)

Question 1 continued

(c) Refer to the Electricity (Safety) Regulations 2010 and state **ONE** situation where a fitting or electrical appliance is deemed to be electrically safe and it **does not** have a current tag issued in accordance with AS/NZS 3760.

(2 marks)

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Ref: ....

(d) Refer to the Electricity (Safety) Regulations 2010 and state **TWO** circumstances where a person **cannot inspect** prescribed electrical work.

(2 marks)

(1) ____

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(2) ____

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Ref: ....

(turn over)

Question 1 continued

(e) A caravan that is to be hired or leased must comply with the requirements of the Electricity (Safety) Regulations 2010.

(i) Refer to the Electricity (Safety) Regulations 2010 and state what document must exist before a person can hire out a caravan.

(1 mark)

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Ref: ……………………………………………

(ii) Refer to the Electricity (Safety) Regulations 2010 and state **ONE** person who can issue the document stated in (a)(i).

(1 mark)

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Ref: ……………………………………………

(f) Refer to AS/NZS 3000 and state **TWO** types of terminations permitted for **tunnel-type** terminals.

(2 marks)

(1) ____

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(2) ____

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Ref: ……………………………………………

(turn over)

Question 1 continued

(g) Refer to AS/NZS 3000 and state **TWO** methods of obtaining the value of the current in a **final subcircuit** either of which can be used to calculate the **voltage drop** in that circuit.

(2 marks)

(1) ____

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(2) ____

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Ref: ....

(h) Refer to AS/NZS 3000 and state the reason why orange marker tape complying with AS/NZS 2648.1 is installed when underground cables are buried.

(2 marks)

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Ref: ....

(turn over)

Question 1 continued

(i) Refer to AS/NZS 3000 and answer the following:

(i) A 230V, 2.5 mm^2 twin and earth TPS socket outlet final subcircuit has a combined phase and earth conductor resistance of 1.02Ω.

Refer to AS/NZS 3000 and state the type and rating of a protective device for this final subcircuit.

(1 mark)

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Ref: ....

(ii) An earth fault loop impedance test gave a reading of 1.84 ohms. If the circuit is to be protected by a HRC fuse with a maximum operating time of 0.4s, what would be the maximum current rating of that fuse?

(1 mark)

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Ref: ....

(j) (i) Refer to NZECP 34 and state the minimum vertical distance from the ground of a 230V **overhead insulated** sub-main that **crosses a footpath used only by pedestrians**

(1 mark)

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Ref: ....

(ii) Refer to NZECP 34 and state the minimum vertical distance from the ground of a 230V **overhead insulated** sub-main that **crosses a driveway**.

(1 mark)

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Ref: ....

(turn over)

Question 2

The measurement of the earth fault loop impedance of an electrical installation is one of the tests detailed in AS/NZS 3000.

(a) (i) Refer to AS/NZS 3000 and define the term **earth fault-loop impedance**.

(1 mark)

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Ref: ....

(ii) Refer to AS/NZS 3000 and state **ONE** reason why the **impedance** of the **earth fault-loop** must be low.

(2 marks)

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Ref: ....

(turn over)

Question 2 continued

(b) Refer to AS/NZS 3000 and describe the earth fault loop.

(4 marks)

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Ref: ....

(turn over)

Question 2 continued

(c) Refer to AS/NZS 3000 and state **TWO** conditions for using aluminium conductors as earthing conductors.

(2 marks)

(1) ____

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(2) ____

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Ref: ....

(d) Refer to AS/NZS 3000 and state the **type** and **conductor material** that must be used for **copper earthing conductors**.

(1 mark)

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Ref: ....

(turn over)

Question 3

An electrical installation switchboard generally incorporates protective devices for the protection of circuits originating at the switchboard and switching devices for the control of parts of the installation.

(a) Isolators may be incorporated on a switchboard.

Refer to the AS/NZS 3000 and state **FOUR** methods of achieving **isolation**.
(2 marks)

(1) ____

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(2) ____

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(3) ____

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(4) ____

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Ref: ....

(b) Refer to AS/NZS 3000 and state **ONE** isolation switch requirement for an **electrical installation with more than one occupier**.
(2 marks)

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Ref: ....

(turn over)

Question 3 continued

(c) (i) Refer to AS/NZS 3000 and state what **protection by means of automatic disconnection of supply** is intended to **limit**.

(2 marks)

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Ref: ....

(ii) AS/NZS 3000 details the **types of devices** that can be used for protection by automatic disconnection of supply.

Refer to AS/NZS 3000 and state the restriction that applies to a device used for protection by automatic disconnection of the supply.

(1 mark)

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Ref: ....

(iii) Refer to AS/NZS 3000 and state **TWO** types of devices that can be used to provide automatic disconnection of supply.

(2 marks)

(1) ____

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(2) ____

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Ref: ....

(turn over)

Question 3 continued

(d) Refer to AS/NZS 3000 and state **ONE** requirement regarding the **size** of the MEN link or connection in the first MEN switchboard in an electrical installation.

(1 mark)

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Ref: ....

(turn over)

Question 4

Refer to AS/NZS 3000 and calculate the maximum demand **in amps** of a **single** 230V domestic installation with the following loads:

Number	**Rating**	**Equipment**
30	50W	Recessed luminaires
25	8W	LED Lights
4	75W	Fluorescent lights
10	150W	Outdoor flood lighting
16	10A	Double socket outlets
10	10A	Single socket outlets
1	4kW	Gas/electric range
1	3KW	Water storage heater
1	6kW	Sauna

(10 marks)

Where applicable, lights are to be calculated on a **points** basis.

Use the table on the following page to perform the calculations.

(turn over)

Question 4

Equipment	Load Group	Calculation	Load (A)
30, 50W recessed luminaires			
25, 8W LED lights			
4, 75W fluorescent lights			
10, 150W outdoor light lamps			
16, 10A double socket outlets			
10, 10A single socket outlets			
4kW electric range			
3KW water heater			
6kW sauna			
Maximum demand			

Ref: ………………………………………

(turn over)

Question 5

(a) Refer to AS/NZS 3000 and state **FOUR** types of wiring enclosures permitted for **insulated unsheathed cables**.

(2 marks)

(1) ____

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(2) ____

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(3) ____

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(4) ____

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Ref: ....

(b) Refer to AS/NZS 3000 and state the requirement for the **change of wiring enclosures** in situations other than at a switchboard.

(2 marks)

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Ref: ....

(turn over)

Question 5 continued

(c) Refer to AS/NZS 3000 and state **ONE** requirement for the installation of conductors of **different electrical installations**.

(2 marks)

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Ref: ....

(d) Refer to AS/NZS 3000 and state the **THREE** requirements for the **support** of a **low voltage track system.**

(2 marks)

(1) ____

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(2) ____

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(3) ____

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Ref: ....

(turn over)

Question 5 continued

(e) Refer to AS/NZS 3000 and state **FOUR** situations where wiring systems are likely to be disturbed.

(2 marks)

(1) ____

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(2) ____

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(3) ____

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(4) ____

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Ref: ....

(turn over)

Question 6

(a) A certificate of compliance is issued for the installation of conductors and fittings in an electrical installation.

(i) Refer to the Electricity (Safety) Regulations 2010 and state **ONE** type of prescribed electrical work for which a certificate of compliance **may** be issued.

(½ mark)

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Ref: ....

(ii) Refer to the Electricity (Safety) Regulations 2010 and state **TWO** types of prescribed electrical work for which a certificate of compliance **must** be issued.

(1 mark)

(1) ____

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(2) ____

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Ref: ....

(b) Refer to the Electricity (Safety) Regulations 2010 and state the **TWO** items that form the **content of certificates of compliance**.

(4 marks)

(1) ____

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(2) ____

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Ref: ....

(turn over)

Question 6 continued

(c) (i) Refer to the Electricity (Safety) Regulations 2010 and state the **THREE** types of prescribed electrical work for which a electrical safety certificate must be issued

(1½ marks)

(1) ____

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(2) ____

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(3) ____

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Ref: ....

(ii) The Electricity (Safety) Regulations requires that a person who issues an electrical safety certificate must be satisfied that **TWO** conditions exist.

Refer to the Electricity (Safety) Regulations 2010 and state **ONE** of **those** conditions.

(2 marks)

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Ref: ....

(iii) Refer to the Electricity (Safety) Regulations 2010 and state when prescribed electrical work is considered to be complete on an electrical installation for which an electrical safety certificate will be issued.

(1 mark)

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Ref: ....

(turn over)

Question 7

Introduction

Testing is being carried out to establish whether or not a phase/neutral transposition has occurred on the consumers mains of a **live** single-phase low voltage electrical installation

Use the information in the introduction to this question to answer parts 7(a), 7(b) and 7(c).

(a) Refer to AS/NZS 3000 and state **ONE** situation that testing for polarity is intended to prevent in a single-phase low voltage electrical installation.
(1 mark)

(1) ____

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(2) ____

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Ref: ....

(b) List the equipment and test instrument used to test the polarity of the consumers mains in a **live** single-phase low voltage electrical installation.
(3 marks)

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(turn over)

Question 7 continued

(c) There are **TWO** points in the electrical installation where testing is carried out to find out whether or not a phase/neutral transposition has taken place on the consumers mains.

(i) State where the **first** point of testing is and:

- Describe how the testing is carried out using the equipment stated in (b).
- State the expected instrument reading **if a transposition** has taken place.
- State the expected instrument reading **if no transposition** has taken place.

(3 marks)

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(turn over)

Question 7 continued

(ii) State where the **second** point of testing is and:

- Describe how the testing is carried out using the equipment stated in (b).
- State the expected instrument reading **if a transposition** has taken place.
- State the expected instrument reading **if no transposition** has taken place.

(3 marks)

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(turn over)

Question 8

Introduction

A 3 metre wide and 6 metre long in-ground swimming pool is being constructed.

Various items of electrical cables and equipment need to be installed.

Use the information in the introduction to this question to answer parts 8(a), 8(b), 8(c) and 8(d).

(a) Refer to AS/NZS 3000 and state the minimum degree of protection for electrical equipment installed in each Zone of a swimming pool.

(3 marks)

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Ref: ....

(b) Refer to AS/NZS 3000 and state the requirements for a wiring system for a swimming pool.

(2 marks)

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Ref: ....

(turn over)

Question 8 continued

(c) Several **230V** socket outlets for general use are to be installed as close to the pool as possible.

(i) Refer to AS/NZS 3000 and state the **minimum distance** from the pool the socket outlets can be installed.

(1 mark)

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Ref: ....

(ii) Refer to AS/NZS 3000 and state the **TWO** methods of electrical protection that can be used for **these** socket outlets.

(2 marks)

(1) ____

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(2) ____

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Ref: ....

(turn over)

Question 8 continued

(d) A pump house with **230V** electrical equipment for water filtering is to be installed in Zone 1 of the swimming pool. The **electrical equipment** is rated IPX5

Refer to AS/NZS 3000 and state the **TWO** types of **electrical equipment** that can be installed

(2 marks)

(1) ____

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(2) ____

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Ref: ....

(turn over)

Question 9

Introduction

A 230V final subcircuit originating at a factory switchboard supplies one double socket outlet and one single socket outlet.

- **First** socket outlet (double)

  Route length of 15 metres from the switchboard
  4mm^2 twin and earth TPS cable.
  3 kW load.
  The mV/A.m for the 4mm^2 twin and earth TPS cable is 11.2151

- **Second** socket outlet (single)

  Route length of 10 metres from the first socket outlet
  2.5mm^2 twin and earth TPS cable
  2 kW load.
  The mV/A.m for the 2.5mm^2 twin and earth TPS cable is 18.018

- The TPS cable is clipped touching.
- The maximum voltage drop permitted is 2.5%.

Use the information in the introduction to this question to answer parts 9(a) and 9(b).

(turn over)

Question 9 continued

(a) (i) Calculate **maximum current** in the **2.5mm^2 twin and earth TPS cable section** of the final subcircuit

(2 marks)

(ii) Calculate **voltage drop** in the **2.5mm^2 twin and earth TPS cable section** of the final subcircuit

(2 marks)

(b) (i) Calculate **maximum current** in the **4mm^2 twin and earth TPS cable section** of the final subcircuit

(1½ marks)

(ii) Calculate **voltage drop** in the **4mm^2 twin and earth TPS cable section** of the final subcircuit

(1½ marks)

(turn over)

Question 9 continued

(c) Determine by calculation whether the **maximum** voltage drop of the **entire** final subcircuit meets the voltage drop requirements.

(3 marks)

For Candidate's Use

In the box, write the number of **EXTRA** sheets you have used. Write **NIL** if you have not used any

For Examiner's Use Only

Questions Answered	**Marks**	
1		
2		
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7		
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9		
TOTAL		